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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/824,081	04/14/2004	Hiroshi Shingai	890050.478	7013

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EXAMINER

VERDERAME, ANNA L

ART UNIT	PAPER NUMBER
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1795

MAIL DATE	DELIVERY MODE
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11/07/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.		Applicant(s)	
	10/824,081		SHINGAI ET AL.	
	Examiner		Art Unit	
	Anna L. Verderame		1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 September 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

The amendment filed on 09/04/2007 has been carefully considered by the examiner. A response to the amendment is found below.

Claim Rejections - 35 USC § 103

1. Claims 1-5 and 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. 6,149,999 in view of Ohno et al. 6,004,646 and Hirotsune et al. 6,856,589.

In example 7, Suzuki et al manufactures a phase-change optical recording medium of the layer composition as shown in figure 20. A first heat diffusion layer 7 comprising aluminum nitride was formed to a thickness of 50 nm on a substrate 1. A lower protection layer 2 comprising a film of mixture of ZnS and SiO₂ was formed on the heat diffusion layer. An interface control layer 3 was formed on the lower protection layer. On the interface control layer 3 were formed a recording layer 4 comprising Sb-Te-Ge at a thickness of 25 nm and an upper protection layer 5 comprising a film of mixture of ZnS and SiO₂ at a thickness of 20 nm thereon, a reflection layer 6 comprising Al to a thickness of 100 nm, and a UV-curable protection coat (24/1-25). 1,7RLL modulation was used(24/37).

For recording and reproducing light is shone through substrate 1. Shining light through the protective coating would not work due to the presence of a 100nm thick metal reflective layer.

Suzuki et al. does not teach the specific recording composition recited in claim 1 or the use of a silver reflective layer.

In examples 13-15 Harigaya et al. teaches an optical recording medium having a phase-change recording layer of $\text{Ge}_4\text{Mn}_7\text{Sb}_{70}\text{Te}_{19}$ and a silver reflection layer on the side of the recording layer opposite the light incidence plane (table 1 and (16/11-34)). These media were recorded at a linear velocity of 17.5 m/s. Recording data were recorded by (8-16) modulation at a recording power of 19 mW, a bias (bottom) power of 0.1 mW, and an erasing power of 6 mW (16/50-55).

The composition taught by this reference contains antimony (a) in the amount of 70 %. This is within the range of 55 to 70 recited in claim one. The composition taught by this reference contains Germanium in the amount of 4%. This is within the range of 4 to 10 recited in the claims. The composition taught by this reference contains Mn(d) in the amount of 7%. This is not within the range of 10 to 20 recited in claim 1. The ratio of a/b for the composition taught in this reference is (70/19) 3.7. This is not within the range recited in claim 1. The ratio of a/d for the composition taught by this reference is (70/7) 10. This is not within the range of 3 to 6 recited in claim 1.

The ratio of P_e/P_w in this reference is 0.32.

Sb content should be in the 65-80 and Te should be in the range of 15 to 25. Ge can be added to improve the storage property of the recorded mark under high temperature environment. Ge content should be in the range of 1 to 5. Mn has been found to increase the crystallization rate without raising the crystallization temperature.

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Mn may be added in the range of between 1 to 10% (4/38-6/5). This reference teaches a recording layer having 10% Mn which is in the range of 10-20 recited by the applicant.

Harigaya et al. is relied upon for its teaching to use a silver reflective layer on the side of the recording layer opposite the light-incidence plane. The recording layer of Harigaya et al. is also substantially similar to that presented in the instant application. However, the reference no longer teaches the recording layer composition claimed by the applicant as a result of the applicant's amendment to include the limitation that the content of Mn in the recording layer is "greater than 10% and less than 20%".

Ohno et al teaches a phase-change optical recording composition of $M_w(Sb_zTe_{1-z})_{1-w}$ where $0 \leq w \leq 0.2$, $0.5 \leq z \leq 1$, and M is at least one member selected from the group consisting of Ge, and Mn among others(6/5-10). As a preferred example of the recording layer an alloy having the composition $Mb_vMc_y(Sb_xTe_{1-x})_{1-v-y}$, where Mb is at least one member selected from the group consisting of Ag and Zn, Mc is Ge or Sn, $0.6 \leq x \leq 0.8$, $0.01 \leq y \leq 0.15$, $0.01 \leq v \leq 0.15$, and $0.02 \leq v+y \leq 0.2$ (7/1-6). In example 6 a recording layer having the specific composition **Ag₉Ge₆Sb₆₇Te₁₈** is disclosed (31/50-61).

Hirotsune et al. teaches recording films 13 and 17 as alternatives of Ge₅Sb₂Te₈ recording films. Recording films 13 and 17 are Ag-Ge-Sb-Te type and Cr-Ge-Sb-Te types. It was found that Ag to be added to the recording films 13, 17 was replaceable

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with at least one out of a group including **Mn** while maintaining favorable overwrite characteristics (17/13-35).

In view of the teachings of Hirotsune that Ag in Ag-Sb-Te-Ge type recording films can be replaced with Mn while maintaining good overwrite characteristics, it would have been obvious to replace Ag with Mn in the Ag-Sb-Te-Ge recording compositions taught by Ohno et al. at (7/1-6).

One could imagine a recording composition according to the formula found at (7/1-6) of Ohno et al. in which M_b is Mn, M_c is Ge, v is 0.15, y is 0.05, x is 0.7275, and Te is 0.2725. This composition contains 5% Ge, 15% Mn, 58.2% Sb, and 21.89% Te. This composition is very similar to that disclosed in the applicant's first working example.

It would have been obvious to one of ordinary skill in the art to modify the optical recording medium taught by Suzuki et al. by forming the recording layer of an Sb-Te-Ge-Mn phase-change composition and by forming the reflective layer of a Ag alloy containing 90 atomic% or more of Ag based on the examples 13-15 found in table 1 of Harigaya et al. Further, it would have been obvious to use the specific composition $\text{Ge}_5\text{Mn}_{15}\text{Sb}_{58.2}\text{Te}_{21.89}$, in which the content of Mn is greater than 10% and less than 20% and is greater than the amount of Ge in the composition, rendered obvious above by the combined teachings of Ohno et al. and Hirotsune et al.

In regard to claims 8-10, it would have been obvious to record the phase-change optical recording medium containing a Sb-Te-Ge-Mn recording layer using a linear

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velocity in the range of 14 m/s to 21 m/s based on the example of Harigaya et al. at (16/50-55) with the reasonable expectation of success in recording the medium.

2. Claims 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. 6,149,999 in view of Harigaya et al. 6,770,346, Ohno et al. 6,004, 646 and Hirotsume et al. 6,856,589 as applied above, further in view of Ohkura et al. 2003/0152006, Yoshioka et al. Re. 36,383, and Ovshinsky 6,011,757.

Suzuki et al. 6,149,999 in view of Harigaya et al. 6,770,346, Ohno et al. 6,004, 646 and Hirotsume et al. 6,856,589 as applied above do not disclose dielectric layers having thicknesses in the ranges recited by the applicant in claims 6-7.

Ohkura et al teaches an optical recording medium where the thickness of the first dielectric layer (disposed on light incident side) have a thickness in the range of from 20 nm to 250 nm (0072). The second dielectric layer preferably has a thickness of from 10 nm to 40 nm (0074).

Yoshioka et al. discloses that typically the active layer (phase-change recording layer) in an optical disk is sandwiched between dielectric layers which have excellent heat resistance characteristics. These dielectric layers serve to contain the active layer and to protect a substrate and an adhesive layer from undergoing large changes in temperature during irradiation. Since the thermal behavior of the active layer both as to its ability to rapidly increase in temperature as well as its rapid cooling and slow cooling characteristics depends on the thermal conductivity of these dielectric layers, it is possible to optimize the recording and erasing characteristics by properly choosing the

materials of the dielectric layers and by carefully controlling the thicknesses and composition of these layers (2/10-22).

Ovshinsky teaches that the thickness of the layers including the layers of the phase-change memory material are engineered to minimize energy necessary for effecting the state-change as well as to optimize the high contrast ratio, high carrier to noise ratio, and high stability of the optical phase-change material(1/10-32).

With respect to the thicknesses of the first and second dielectric layers, the experimental modification of this prior art in order to ascertain optimum operating conditions fails to render applicants' claims patentable in absence of unexpected results. In re Aller, 105 USPQ 233. One of ordinary skill in the art would have been motivated to adjust the thicknesses of the first and second dielectric layers in order to effect the thermal behavior of the active layer both as to its ability to rapidly increase in temperature as well as its rapid cooling and slow cooling characteristics as taught by Yoshioka et al. A prima facie case of obviousness may be rebutted, however, where the results of the optimizing variable, which is known to be result-effective, are unexpectedly good In re Boesch and Slaney, 205 USPQ 215.

It would have been obvious to modify the optical recording medium taught by the combination of Suzuki et al. 6,149,999 in view of Harigaya et al. 6,770,346, Ohno et al. 6,004, 646 and Hirotsume et al. 6,856,589 by forming the first dielectric layer to have a thickness of between 20 to 40 nm and to form the second dielectric layer to have a thickness in the range of 10 to 16 nm based on the disclosure of Ohkura et al. at (0072) and (0074).

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3. Claims 11-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. 6,149,999 in view of Harigaya et al. 6,770,346, Ohno et al. 6,004, 646 and Hirotune et al. 6,856,589 as applied above, further in view of Ando et al. 6,519,413.

Ando et al. teaches an optical recording medium shown in figure 13 containing a lead-in area 1002. In the embossed-data zone of the lead-in area 1002, the following pieces of information have been recorded beforehand: information on recording, reproducing, and erasing characteristics, including the recording power, recording pulse-width, erasing power, reproducing power, and linear velocity in recording or erasing (16/49-61). The invention of this application is applicable to phase-change optical recording media (16/23-24). The lead-in area also contains a trial recording area (for checking the recording and erasing conditions)(16/66-17/2).

In regarding to claims 14-15 the limitation that ID data be "written therein" is met by the teaching that the data is "embossed" into the medium.

It would have been obvious to one of ordinary skill in the art to modify the optical recording medium taught by Suzuki et al. 6,149,999 in view of Harigaya et al. 6,770,346, Ohno et al. 6,004, 646 and Hirotune et al. 6,856,589, by having ID data, including information on recording velocity, and erasing, and recording power, written therein based on the teachings of Ando et al. Further, it would have been obvious to have the specific linear velocity written therein be in the range of 14 m/s to 21 m/s based on the example of Harigaya et al. at (16/50-55) and have the ratio of P_e/P_w written therein be in the range of 0.3 to 0.7 based on the example of Harigaya et al. at

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(16/50-55) with the reasonable expectation of success in recording/erasing/reproducing the medium.

Conclusion

Response to Arguments

4. The examiner agrees with the applicant's argument with regard to the addition of Mn to the Ge-Mn-Sb-Te recording layer Harigaya et al. teaches that the content of Mn is both less than 10% and that the content of Mn is greater than that of Ge. In the rejection above Harigaya et al. is relied upon for its teachings of the use of a Ag reflective layer with the Ge-Mn-Sb-Te phase-change recording layer. The reference is also relied upon for disclosure of recording velocities.

The combined teachings of Hirotsune et al. and Ohno et al. are used to reject the specific recording composition recited in the instant claims. Ohno et al. teaches a recording composition consisting of $Mb_v Mc_y (Sb_x Te_{1-x})_{1-v-y}$, where Mb is at least one member selected from the group consisting of **Ag** and Zn, Mc is **Ge** or Sn, $0.6 \leq x \leq 0.8$, $0.01 \leq y \leq 0.15$, $0.01 \leq v \leq 0.15(1-15\%)$, and $0.02 \leq v+y \leq 0.2(7/1-6)$. The specific recording composition **Ag₉Ge₆Sb₆₇Te₁₈** is disclosed.

The applicant argues that the reference teaches only combinations of AgZn or GeSn with SbTe. However, the reference actually teaches choosing one element from those disclosed as acceptable for Mb(Ag or Zn) and one element from those disclosed as acceptable for Mc(Ge or Sn).

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The applicant points to a teaching in Ohno et al. which discloses that "if too much Ag is added they tend to impair the stability of amorphous marks"(column 6, lines 23-29). The examiner acknowledges this teaching but points to disclosure that Ag can be added in the range of between 1-15%(7/1-6). Therefore the teaching of "too much" includes amounts greater than 15%.

Hirotsune et al. is used for its disclosure that Ag can be replaced with Mn in Ag-Ge-Sb-Te type recording films.

Based on the teachings of Hirotsune et al., one of ordinary skill in the art would be motivated to replace the Ag in the recording composition taught by Ohno et al. with Mn.

5. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

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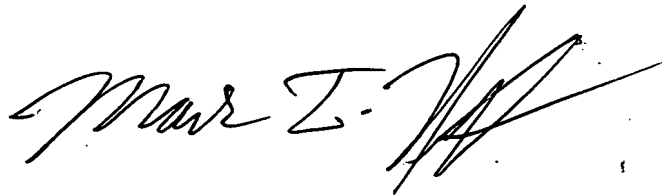
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anna L. Verderame whose telephone number is (571)272-6420. The examiner can normally be reached on M-F 8A-4:30P.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on (571)272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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